

Internally cooled strand-guiding rollCROSS REFERENCE TO RELATED APPLICATIONS

The present application is a 35 U.S.C. §§ 371 national  
5 phase conversion of PCT/EP2004/007399, filed July 7,  
2004, which claims priority of Austrian Application No.  
A 1132/2003, filed July 18, 2003. The PCT International  
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10 BACKGROUND OF THE INVENTION

The invention relates to an internally cooled strand-  
guiding roll, preferably for a continuous casting  
installation, having a central rotatable shaft and at  
least one roll shell which is supported fixed against  
15 rotation on this shaft.

Strand-guiding rolls are used in continuous casting  
installations to support and guide continuously cast  
metal strands after they have emerged from a permanent  
20 mold in a strand-guiding stand. They are exposed to  
high thermal stresses, since the cast metal strands  
leave the mold at a temperature of over 1000°C, in  
particular in the case of steel strands. When producing  
relatively thick strands, especially in slab formats, a  
25 considerable liquid core is also still present in the  
strand, as a result of which ferrostatic forces act on  
the strand-guiding rolls. In addition, the strand-  
guiding rolls have to be able to withstand deformation  
forces from the strand bending. Accordingly, the  
30 strand-guiding rolls are usually equipped with internal  
cooling and have a robust design which matches the  
mechanical stresses. Large strand widths of the cast  
strands of up to 3 m require multiple mounting of the  
strand-guiding roll, and accordingly a multi-part  
35 structure of the supporting strand-guiding rolls.

A number of proposed solutions for the configuration of  
the internal cooling of a strand-guiding roll are  
already known from the prior art.

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According to one group of proposed solutions, an annular coolant passage or a plurality of flow passages in an annular arrangement are arranged between a roll  
5 shell and a central shaft or axle. One general drawback of this embodiment results from the considerable distance between the roll surface and the coolant passages, resulting in excessively high surface temperatures at the roll shell on account of the  
10 delayed heat transfer, with the result that additional external cooling is required.

A strand-guiding roll which belongs to this group of strand-guiding rolls is known, for example, from DE-  
15 A 25 52 969. This is a strand-guiding roll with a multiply mounted continuous shaft, on which individual roll shells are arranged fixed against rotation by a welded join. An annular space is formed as coolant passage between the central shaft and each roll shell,  
20 and this annular space is connected to central supply lines. This welded design does not allow the strand-guiding roll to be dismantled and therefore does not allow the roll shells, which are subject to high thermal and mechanical stresses, to be replaced. Since  
25 the coolant passage runs between the shaft and the roll shell, it is at a considerable distance from the roll shell surface, which has an adverse effect on the dissipation of heat from the roll shell. Rather, the roll shell as a whole in fact acts as a heat  
30 accumulator.

WO 02/38972 A1, with reference to Figures 1a and 1b, reports a prior art which relates to a strand-guiding roll with a central, multiply mounted shaft and a  
35 plurality of roll shells arranged thereon. The entire inner surface of each roll shell bears against the outer surface of the shaft and is joined to it fixed

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against rotation by a feather key. This strand-guiding roll is internally cooled by means of a coolant line which is routed centrally within the shaft. A strand-guiding roll of this type has the fundamental drawback  
5 of a particularly long heat transfer path from the shell surface to the coolant line. The assembly-related annular gap between the shaft and the roll shell acts as an insulator and additionally impedes the dissipation of heat from the strand-guiding roll.

10

Furthermore, WO 02/38972 A1 has disclosed a strand-guiding roll with a multiply mounted shaft and roll shell fitted onto it, each roll shell being arranged fixed against rotation on the shaft by means of a  
15 feather key. An annular space, which is filled with a material with a high thermal conductivity, is formed between the roll shell and the shaft over a subregion of the longitudinal extent of the roll shell. The heat is dissipated from the strand-guiding roll by internal  
20 cooling via a central coolant line which passes through the shaft. The thermally conductive filler material avoids the barrier action of an air gap between roll shell and shaft, but nevertheless there is still a considerable distance between the thermally stressed  
25 roll shell surface and the coolant line.

A strand-guiding roll with a single roll shell and coolant passages of various configurations between the roll shell and the roll core is also known from US-  
30 A 4,442,883.

According to a further group of known proposed solutions, coolant passages are integrated directly in a substantially single-piece roll body, these coolant  
35 passages being formed by through-bores. It is in this way possible for the coolant passages to be arranged close to the roll surface and to achieve an increased

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cooling action by means of the resulting shorter heat transfer path.

Strand-guiding rolls of this type, with coolant bores  
5 distributed uniformly close to the roll surface, are  
already known from WO 93/19874, US-A 5,279,535 and US-  
A 4,506,727. These strand-guiding rolls are formed by a  
single-piece roll body with bearing journals adjoining  
10 it on both sides. The coolant is supplied via a rotary  
leadthrough, which adjoins the bearing journals at the  
end sides, and a central supply bore, from which radial  
branch lines lead to the coolant bores arranged at the  
roll periphery. A multiplicity of peripheral coolant  
bores are supplied with coolant from one branch line,  
15 with coolant flowing through the strand-guiding roll in  
alternating directions. The coolant is diverted in  
annular flanges attached to the end sides of the roll  
body by means of corresponding diversion passages which  
connect successive coolant bores to one another.  
20 However, single-piece strand-guiding rolls can only be  
used in continuous casting installations for producing  
relatively narrow slab strands with a width of up to  
900 mm, and for strands with a bloom and billet cross  
section. In addition, in the event of damage to the  
25 roll surface, the single-piece roll requires complex  
repair work or requires the entire strand-guiding roll  
to be replaced.

A strand-guiding roll likewise with a single-piece  
30 structure of the roll body and therefore restricted  
possible uses is known from DE-C 33 15 376. Only the  
distribution of coolant to the peripherally arranged  
coolant bore takes place selectively, starting from a  
coolant chamber arranged in the roll body, by means of  
35 a control disk which opens up individual coolant bores.

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**SUMMARY OF THE INVENTION**

Therefore, it is an object of the present invention to avoid the drawbacks of the known prior art and to propose a strand-guiding roll with internal cooling  
5 which quickly dissipates the heat quantities taken up by the roll shell and is better able to withstand the mechanical and thermal stresses caused by the strand. In particular, it is intended for it to be possible to increase the ease of maintenance of the strand-guiding  
10 roll and to carry out maintenance work more cost-effectively. A further object of the invention is to provide a strand-guiding roll which is suitable even for large cast widths and is structured in such a way that maintenance work can be restricted to replacing  
15 components that are susceptible to wear.

In a strand-guiding roll of the type according to the invention, this object is achieved by virtue of the fact that the roll shell has coolant passages passing  
20 through it, and the coolant passages are arranged in the roll shell at a constant distance from the cylindrical roll shell outer surface of the roll shell. According to a preferred embodiment, the coolant passages in the interior of the roll shell are oriented  
25 parallel to the axis of rotation of the strand-guiding roll. However, they may also be arranged helically, i.e. along a helical line around the axis of rotation of the strand-guiding roll, in terms of their longitudinal extent. The coolant passages are  
30 distributed uniformly in the interior of the roll shell, at the roll periphery near the roll shell outer surface, and are formed by through-bores, resulting in uniform roll shell cooling. The distance between the coolant passages and the roll shell outer surface is  
35 preferably between 10 and 40 mm. Therefore, the central shaft remains as far as possible unaffected by the thermal stressing of the roll shell. The supply of the

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coolant passages with coolant from central coolant lines in the central shaft is effected in any desired configuration.

- 5 To simplify production of the coolant passages in the roll shell, the roll shell may comprise two annular sleeves which are rotationally fixedly connected to one another, and the coolant passages, at the connecting lateral surfaces of the two annular sleeves, are  
10 machined into at least one of these connecting lateral surfaces. The two annular sleeves of the roll shell may be connected, for example, by a shrink-fit connection or by end-side welding.
- 15 According to another expedient embodiment, it is likewise possible for the coolant passages to be moved as close as possible to the roll shell outer surface, by virtue of the fact that the roll shell comprises at least one outer sleeve, which forms the roll shell  
20 outer surface, annular side parts and a displacement body, and this displacement body is inserted in a cavity in the roll shell extending between the annular side parts, the displacement body, together with the inner wall of the outer sleeve, forming coolant  
25 passages for a coolant to pass through. The displacement body, which is preferably made from a plastic, makes it simple to form coolant passages which are configured and routed in any desired way. The cross sections of the coolant passages may also adopt the  
30 shape of ring segments or may be reduced to a single annular coolant passage.

According to a preferred embodiment of the invention, at least one water guide ring is arranged between the  
35 roll shell and the central shaft. According to an expedient embodiment, the water guide ring is arranged in the end regions of the longitudinal extent of the

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roll shell, between the roll shell and the central shaft. Designing the water guide rings as independent components and arranging them in the edge regions of each roll shell results in functional separation  
5 between the components. The water guide ring is used exclusively to supply coolant to the coolant passages, and its internal diameter and external diameter are dimensioned in such a way that as far as possible no reaction forces from the strand and also no driving  
10 forces from the roll drives act on it and are transmitted via it. At the same time, suitable steps in the shaft diameter at the contact surfaces with the water guide rings result in simple assembly and dismantling of the strand-guiding roll for maintenance  
15 work and allow a roll shell to be replaced.

An advantageous configuration consists in the fact that the coolant passages in the roll shell are connected, via substantially radial branch lines, to a coolant  
20 line, which is arranged in the central shaft, for supplying and discharging a coolant, and the radial branch lines are routed through the water guide rings.

If water guide rings are arranged between the central  
25 shaft and the roll shell, the radial branch lines are arranged within the longitudinal extent of the water guide rings. It is expedient for the radial branch lines, within the longitudinal extent of the water guide rings, to open out into at least one distributor  
30 annular groove of the water guide ring. It is in this way possible for a multiplicity of peripheral coolant passages to be uniformly supplied with coolant from one coolant line arranged in the central shaft and at least one adjoining radial branch line for the supply and  
35 discharge of coolant.

In particular for manufacturing technology reasons, the

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branch lines in the roll shell are formed by substantially half-moon-shaped milled-out portions, in one side cheek of which in each case one of the peripheral coolant passages opens out.

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A substantially optimum ratio of cooling action and manufacturing technology outlay involved in the production of the coolant passages is achieved if a plurality of, preferably three, coolant passages  
10 arranged parallel next to one another in the roll shell are connected to form one continuous coolant passage, and connecting passages between adjacent coolant passages are formed by end-side milled-in formations in the roll shell.

15

To transmit the forces acting on the roll shell to the central shaft, the roll shell is supported directly on the central shaft at least over a subregion of its longitudinal extent.

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To avoid leaks at the coolant lines between the individual components of the strand-guiding roll, sealing elements, preferably sealing rings inserted into annular grooves, are arranged between the water  
25 guide rings and the roll shell and between the water guide rings and the central shaft.

A positively locking connection of the roll shell on the central shaft is achieved by at least one rotation  
30 preventer, preferably by one or more feather keys or other components with a similar action.

One possible configuration of the passage of coolant through the strand-guiding roll consists in the fact  
35 that the coolant line, which is routed in the central shaft, starts from one end side of the central shaft, and the coolant line for discharging coolant, which is



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arranged in the central shaft, opens out at the opposite end side of the central shaft, and each coolant line is assigned a rotary leadthrough.

- 5 An advantageous embodiment which allows the supply of coolant to the strand-guiding rolls to be restricted to one side of the installation or one side of the strand guidance of a continuous casting installation, consists in the fact that the coolant lines for supplying and  
10 discharging the coolant which are routed in the central shaft open out in one end side of the central shaft, and these coolant lines are assigned a multi-start rotary leadthrough. This embodiment can preferably be used for driven strand-guiding rolls, but can also be  
15 used for nondriven strand-guiding rolls.

The coolant used is usually cooling water.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

- 20 Further advantages and features of the present invention will emerge from the following description of non-restricting exemplary embodiments, in which reference is made to the accompanying figures, in which:
- 25 Figure 1 diagrammatically depicts a longitudinal section through a strand-guiding roll according to the invention,
- Figure 2 diagrammatically depicts a cross section  
30 through the strand-guiding roll on section line A-A in Figure 1,
- Figure 3 diagrammatically depicts a cross section through the strand-guiding roll on section line B-B in Figure 1,
- 35 Figure 4 diagrammatically depicts a longitudinal section through another embodiment of a strand-guiding roll according to the

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invention,  
Figure 5 diagrammatically depicts a two-part roll  
shell with a helical coolant passage,  
Figure 6 diagrammatically depicts a longitudinal  
5 section through another embodiment of a  
strand-guiding roll according to the  
invention.

#### **DESCRIPTION OF PREFERRED EMBODIMENTS**

10 The illustrations in the figures show a strand-guiding  
roll according to the invention in diagrammatic form,  
this roll being suitable, for example, for use in a  
strand-guiding system of a continuous casting  
installation for producing metal strands of a  
15 considerable width with a slab or thin slab cross  
section. Identical or equivalent components in  
different embodiments are denoted by the same reference  
designations.

20 The strand-guiding roll illustrated in Figure 1  
comprises a continuous, central shaft 1, which is  
supported rotatably in four bearings 2. The bearings  
and the bearing housings 3 which carry them are for  
their part supported in a strand-guiding stand (not  
25 shown) of a continuous casting installation. The  
bearings used are usually rolling-contact bearings. The  
central shaft 1 is assigned three roll shells 4, each  
of the three roll shells being supported directly on  
the shaft 1. During the production phase of the  
30 continuous casting installation, the roll shell outer  
surface 4a of the roll shell is in linear contact with  
the cast strand and takes up heat from it. In addition,  
each roll shell is assigned two water guide rings 5,  
these water guide rings 5 being positioned between the  
35 central shaft 1 and the roll shell 4, in the end  
regions of its longitudinal extent.

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The bearings 2 and the bearing housings 3 surrounding them are located outside the longitudinal extent of the adjacent roll shells 4. The position of each roll shell 4 is fixed against rotation with respect to the shaft 1 by a rotation preventer 6. This rotation preventer 6 is formed by a feather key 7 which engages, centrally with respect to the longitudinal extent of the respective roll shell 4, in associated longitudinal grooves 8, 9 in the central shaft 1 and the respective roll shell 4, forms a positively locking connection and transmits torques acting on the rolls.

The strand-guiding roll is equipped with internal cooling. The path of the coolant flow is indicated by arrows in Figure 1. The coolant is supplied at one end side of the central shaft 1 via a rotary leadthrough 10, which is fitted into an end-side recess 11 in the central shaft 1. The coolant is discharged at the opposite end side of the central shaft 1 through a further rotary leadthrough 12, which is likewise fitted into an end-side recess 13 in the central shaft. Via a central coolant line 15, which passes through the central shaft 1 in the axial direction, via radial branch lines 16, which branch off from the central coolant line 15 and open out in a first distributor annular groove 17 at the water guide ring 5, via further radial branch lines 18, which connect the first distributor annular groove 17 to a second distributor annular groove 19 at the water guide ring 5, and via further radial branch lines 20 in the roll shell 4, which are formed by half-moon-shaped milled-out portions 21, coolant is introduced into coolant passages 22, which open out into cheeks of these milled-out portions 21, run parallel to the axis of rotation 25 of the strand-guiding roll and are distributed uniformly in the interior of the roll shell 4 at a short distance from the roll shell surface.

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The coolant flows in series through three coolant passages 22a, 22b, 22c arranged in the periphery of the roll shell 4, next to one another in the circumferential direction, as illustrated in Figure 2 which represents a sectional illustration on line A-A from Figure 1, this section being taken through the second distributor annular groove 19 and the inlet-side half-moon-shaped milled-out portion 21. These coolant passages 22a, 22b, 22c are connected by connecting passages 26, 27, which are formed by covered milled-in formations in the end sides of the roll shell 4. A uniform cooling action over the longitudinal extent of the roll shell is achieved by reversing the direction of flow in adjacent coolant passages 22a, 22b and 22b, 22c. The combination of three adjacent coolant passages 22a, 22b, 22c has in this case proven to be the most effective embodiment, since the uptake of heat by the coolant in one roll shell is kept within a range which ensures approximately the same order of magnitude of uptake of heat in the roll shells through which the coolant subsequently flows.

In the embodiment illustrated in Figure 1, the coolant passages 22 are formed by through-bores which are routed close to the roll shell outer surface 4a, parallel to the axis of rotation 25 of the strand-guiding roll. The distance between the coolant passages 22 and the roll shell outer surface 4a is approximately 10 to 40 mm, thereby allowing intensive cooling and dissipation of heat, so that in steady-state casting operation low surface temperatures of from 130° to 180° can be maintained.

Figure 3 shows another sectional illustration of the strand-guiding roll on section line B-B from Figure 1, this section being taken through the radial branch

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- bores 16, 18. This illustration shows the central coolant line 15 in the central shaft 1, the four branch lines 16, which lead radially away from the central coolant line and open out in a first distributor annular groove 17, and four radial branch lines 18 which lead further onward and produce the connection to the second distributor annular groove 19. The coolant passages 22a, 22b, 22c, which are combined via connecting passages, of which only the connecting passage 26 is illustrated, open out into the half-moon-shaped milled-out portion 21, which adjoins the coolant passage 22c on the outlet side and is indicated by thin lines in this figure.
- 15 The coolant is returned from the peripheral coolant passages 22 in the reverse order to the way in which it was supplied. The connected coolant passages 22a, 22b, 22c open out into branch lines 20, which are formed by half-moon-shaped milled-out portion 21 in the roll shell 4 and produce a connection to the second distributor annular groove 19 in the water guide ring 5. Branch lines 18 connect the second distributor annular groove 19 to a first distributor annular groove 17 in the water guide ring 5, from where further radial branch lines 16 return the coolant into the central coolant line 15, through which the coolant leaves the strand-guiding roll again via the rotary leadthrough 12.
- 30 A number of blocking elements 28 corresponding to the number of roll shells 4 are inserted into the central coolant line 15 and are used to interrupt the continuous central coolant line in such a way that the coolant passes through the individual roll shells of a strand-guiding roll in one pass.

However, it is also possible for the coolant to be

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supplied and discharged through the central coolant lines at just one end side of the central shaft, via a two-start rotary leadthrough, with the result that the coolant supply is restricted to one side of the strand-guiding arrangement and therefore one side of a continuous casting installation.

The supply of coolant to and discharge of coolant from the strand-guiding roll may also take place via the strand-guiding stand and the bearing blocks of the bearings which support the strand-guiding roll.

To ensure that it is impossible for any coolant to escape at the contact surfaces between central shaft 1 and the water guide rings 5 and/or at the contact surfaces between roll shell 4 and the water guide rings 5, sealing elements 19 are arranged in these regions. These sealing elements are formed by sealing rings fitted into annular grooves.

Figure 4 diagrammatically depicts a strand-guiding roll of the type according to the invention without the incorporation of a water guide ring. A roll shell 4 is supported directly on the central shaft 1 and is protected against rotation by a rotation preventer 6, which is formed by a feather key, thereby allowing torque to be transmitted from the shaft to the roll shell and vice versa. As in the embodiment shown in Figure 1, it is possible for a plurality of roll shells to be provided, with the interconnection of a bearing position for the continuous central shaft.

The coolant is passed through the strand-guiding roll starting from a rotary leadthrough 10 then through the central coolant line 15 and branch lines 30 to the axial coolant passages 22 and from the latter back through branch lines 30 and the central coolant line 15

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to a further rotary leadthrough 12. Sealing elements 29 are fitted, for example, into the inner shell surface of the roll shell 4, laterally with respect to the branch lines 30, in annular grooves, preventing leakage losses. The coolant passages 22 are formed by through-bores in the roll shell 4.

As is diagrammatically depicted in Figure 5, it is also possible for a coolant passage 22 which runs helically along a helical line about the axis of rotation 25 of the strand-guiding roll to pass through the roll shell 4. The roll shell 4 is formed by two annular sleeves 31, 32 which are connected to one another in a manner fixed against rotation, in which case, at the connecting lateral surfaces 31a, ~~31b~~ 32a of these sleeves 31, 32, a helical coolant passage 22 is machined into one of these lateral surfaces, **here** 32a. The connection of the two sleeves 31, 32 in a manner fixed against rotation is produced by welding. However, it may also be effected by shrink-fitting. Equally, it is also possible for the roll shell to be formed by two sleeves that are connected in a manner fixed against rotation in the arrangement of straight coolant passages arranged parallel to the axis of rotation of the strand-guiding roll. In this case, the coolant passages can be produced in the inner lateral surface or outer lateral surface of the connecting lateral surfaces by longitudinal impacting, in a manner which is simple in terms of manufacturing technology.

Another embodiment of the strand-guiding roll according to the invention is illustrated in Figure 6. A roll shell 4, which is formed by an outer sleeve 34, annular side parts 35, 36 and a displacement body 37, is supported on the central rotatable shaft 1. The roll shell is fixed to the central shaft 1 using rotation preventers 6. Water guide rings 5 are arranged between

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the roll shell 4 and the central shaft 1 in the end regions of the longitudinal extent of the roll shell, and allow the coolant to be transferred from a coolant line 15 arranged in the central shaft via branch lines 16 and connecting lines 38 to at least one coolant passage 22, preferably coolant passages 22 distributed uniformly on a pitch circle. The coolant is discharged in a similar way as in the embodiments which have already been described. The coolant passages 22 arranged parallel to the axis of rotation 25 of the strand-guiding roll are formed by the inner wall 4b of the roll shell 4 and recesses at the outer circumference of the displacement body 37. The direction of flow of the coolant, the cross-sectional shape of the coolant passages and their straight or helical orientation can be configured entirely as desired in this context.

The invention is not restricted to the present exemplary embodiment. Rather, this strand-guiding roll can be modified in numerous ways within the scope of protection.

By way of example, the strand-guiding roll may, depending on the installation-specific casting widths on a continuous casting installation, comprise a certain number of roll shells; from one to four roll shells arranged on one continuous central shaft are customary for supporting and guiding cast strands. It is also possible for in each case two water guide rings arranged between a roll shell and the central shaft to be combined in one water guide ring of sleeve-like design, in which case the sleeve-like water guide ring has the rotation preventer passing through it. Furthermore, the roll shell outer surface may additionally be protected from the high levels of wear by welded-on applications. However, it is also possible



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within the scope of protection for an additional wear-resistant sleeve to be applied to the roll shell, for example by shrink-fitting or end-side welding, with this sleeve being removed or replaced as it becomes  
5 worn.

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Patent claims:

1. An internally cooled strand-guiding roll~~{,~~  
5 ~~preferably}~~ for a continuous casting installation,  
~~{having}~~ **comprising:**  
a central rotatable shaft~~{(1) and}~~, at least one  
roll shell ~~{(4)}~~ **around the shaft and** which is  
supported fixed against rotation on ~~{this}~~ **the** shaft,  
10 ~~{characterized in that}~~ the roll shell ~~{(4) has}~~ **having**  
**a cylindrical roll shell outer surface;**  
coolant passages ~~{(22, 22a, 22b, 22e)}~~ passing  
through ~~{it, and}~~ **the roll shell,** the coolant passages  
~~{are}~~ **being** arranged in the roll shell at a constant  
15 distance from the cylindrical roll shell outer surface  
~~{(4a)}~~ of the roll shell.
  
2. The strand-guiding roll as claimed in claim 1,  
~~{characterized in that}~~ **wherein** the coolant passages  
20 ~~{(22, 22a, 22b, 22e)}~~ in the roll shell ~~{(4)}~~ are  
oriented parallel to ~~{the}~~ **an** axis of rotation ~~{(25)}~~  
of the strand-guiding roll.
  
3. The strand-guiding roll as claimed in claim 1,  
25 ~~{characterized in that}~~ **wherein** the coolant passages  
~~{(22, 22a, 22b, 22e)}~~ in the roll shell ~~{are arranged}~~  
**extend** helically around the axis of rotation ~~{(25)}~~ of  
the strand-guiding roll.
  
- 30 4. The strand-guiding roll as claimed in ~~{one of}~~  
~~claims 1 to 3, characterized in that}~~ **claim 1, wherein**  
the roll shell ~~{(4)}~~ comprises two annular sleeves~~{(31,~~  
~~32) which}~~, **the sleeves having connecting lateral**  
**surfaces overlaying each other, the annular sleeves** are  
35 rotationally fixedly connected to one another, and  
the coolant passages ~~{(22, 22a, 22b, 22e),}~~ **are** at  
the connecting lateral surfaces ~~{(31a, 32a)}~~ of the two

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annular sleeves, **and** are ~~{machined into}~~ **in** at least one of ~~{these}~~ **the** connecting lateral surfaces.

5. The strand-guiding roll as claimed in ~~{one of~~  
5 ~~claims 1 to 3, characterized in that}~~ **claim 1, wherein**  
the roll shell ~~{(4)}~~ comprises at least one outer  
sleeve~~{(34)}~~, which forms the roll shell outer  
surface~~{(4a), annular side parts (35, 36)}~~, **the outer**  
10 **sleeve having an inner surface, laterally spaced apart**  
**annular side parts along the roll shell and defining a**  
**cavity between the side parts and inside the outer**  
**sleeve;** and a displacement body ~~{(37), and this~~  
~~displacement body is inserted in a}~~ **in the** cavity in  
the roll shell, **the displacement body** extending between  
15 the annular side parts, the displacement body, together  
with the inner wall ~~{(4b)}~~ of the outer sleeve~~{(34)}~~,  
forming coolant passages ~~{(22)}~~ **at the cavity** for a  
coolant to pass through.

20 6. The strand-guiding roll as claimed in ~~{one of the~~  
~~preceding claims, characterized in that}~~ **claim 1,**  
**wherein the coolant passages are placed in the roll,**  
the distance between the coolant passages ~~{(22, 22a,~~  
~~22b, 22e)}~~ and the roll shell outer surface ~~{(4a)}~~ is  
25 between 10 mm and 40 mm.

7. The strand-guiding roll as claimed in ~~{one of the~~  
~~preceding claims, characterized in that}~~ **claim 1,**  
**further comprising** at least one water guide ring ~~{(5)}~~  
30 is arranged between the roll shell ~~{(4)}~~ and the  
central shaft ~~{(1)}~~ **and is operable for distributing a**  
**coolant to the coolant passages.**

8. The strand-guiding roll as claimed in claim 7,  
35 ~~{characterized in that}~~ **wherein** the water guide ring  
~~{(5)}~~ is arranged ~~{in the}~~ **at** end regions of the  
longitudinal extent of the roll shell~~{(4)}~~, **and** between

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the roll shell ~~{(4)}~~ and the central shaft~~{(1)}~~.

9. The strand-guiding roll as claimed in ~~{one of the preceding claims, characterized in that the coolant~~  
5 ~~passages (22) in the roll shell (4) are connected, via substantially radial branch lines (16, 18, 20, 30), to}~~  
**claim 8, further comprising** a coolant line ~~{(15), which is}~~ arranged in the central shaft ~~{(1),}~~ for supplying and discharging a coolant~~{, and}~~ **substantially radial**  
10 **branch lines connecting the coolant passages in the roll shell;**

the substantially radial branch lines are ~~{preferably}~~ routed through the water guide rings~~{(5)}~~.

15 10. The strand-guiding roll as claimed in claim 9,  
~~{characterized in that the radial branch lines (16, 18, 20), within the}~~ **wherein within a** longitudinal extent of the water guide rings~~{(5),}~~, **the radial branch lines** open out into at least one distributor annular  
20 groove ~~{(17, 19)}~~ of the water guide ring.

11. The strand-guiding roll as claimed in claim 9 ~~{or 10, characterized in that}~~, **wherein** the branch lines ~~{(20, 30)}~~ in the roll shell ~~{(4) are formed by}~~  
25 **comprise** substantially half-moon ~~{shaped milled out}~~ **cross-sectional shape** portions~~{(21)}~~.

12. The strand-guiding roll as claimed in ~~{one of the preceding claims, characterized in that}~~ **claim 1,**  
30 **comprising** a plurality of~~{, preferably three,}~~ **the** coolant passages ~~{(22a, 22b, 22e)}~~ arranged parallel **and generally** next to one another in the roll shell~~{(4) are}~~, **the plurality of passages being** connected to form one continuous coolant passage~~{(22),}~~; and

35 connecting passages ~~{(26, 27)}~~ between adjacent **ones of the** coolant passages ~~{are preferably formed by}~~ **comprising** end-side ~~{milled}~~ in formations in the roll

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shell.

13. The strand-guiding roll as claimed in ~~{one of the  
preceding claims, characterized in that}~~ **claim 8,**  
5 **further comprising** sealing elements~~{(29), preferably  
sealing rings}~~, inserted into annular grooves, ~~{are}~~  
**and** arranged between **the** water guide rings ~~{(5)}~~ and  
**the** roll shell ~~{(4)}~~ and between **the** water guide rings  
~~{(5)}~~ and the central shaft~~{(1)}~~.

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14. The strand-guiding roll as claimed in ~~{one of the  
preceding claims, characterized in that}~~ **claim 1,**  
**wherein** the roll shell ~~{(4)}~~ is supported directly on  
the central shaft ~~{(1)}~~ at least over a subregion of  
15 ~~{its}~~ **the** longitudinal extent **of the roll shell.**

15. The strand-guiding roll as claimed in ~~{one of the  
preceding claims, characterized in that}~~ **claim 1,**  
**further comprising a rotation preventer fixing** the roll  
20 shell ~~{(4) is fixed}~~ against rotation with respect to  
the shaft~~{(1) by at least one rotation preventer (6),  
preferably a feather key (7)}~~.

16. The strand-guiding roll as claimed in ~~{one of the  
preceding claims, characterized in that the}~~ **claim 1,**  
25 **further comprising a supply** coolant line ~~{(15)}~~ for  
supplying coolant~~{, which is}~~ **and being** routed in the  
central shaft~~{(1), starts}~~, **starting** from one end side  
of the central shaft, and

30 ~~{the coolant}~~ **a discharge** line for discharging  
coolant~~{, which is}~~ **and being** arranged in the central  
shaft~~{, opens}~~ **and opening** out at ~~{the}~~ **an** opposite end  
side of the central shaft~~{, and}~~;

each coolant line ~~{is}~~ **being** assigned a **respective**  
35 rotary leadthrough~~{(10, 12)}~~.

17. The strand-guiding roll as claimed in ~~{one of~~

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~~claims 1 to 15, characterized in that~~ **claim 1,**  
**comprising** the coolant lines ~~{which are}~~ routed in the  
central shaft **and** open out ~~{in}~~ **at** one end side of the  
central shaft, ~~{and these}~~ **each of the** coolant lines  
5 ~~{are}~~ **being** assigned a **respective** multi-start rotary  
leadthrough.

~~{Abstract:}~~ 18.                    **The strand-guiding roll as**  
**claimed in claim 1, further comprising a coolant line**  
10 **arranged in the central shaft for supplying and**  
**discharging a coolant, and substantially radial branch**  
**lines connecting the coolant passages in the roll**  
**shell.**

15 ~~{The invention relates to an}~~ 19. **The strand-guiding**  
**roll as claimed in claim 1, wherein the rotation**  
**preventer comprises a feather key between the roll**  
**shell and the shaft.**

**Abstract:**

An internally cooled strand-guiding roll~~{, preferably}~~ for a continuous casting installation, having a central rotatable shaft ~~{(1)}~~ and at least one roll shell ~~{(4)}~~ ~~which is~~ supported fixed against rotation on ~~{this}~~ **the** shaft. To make the strand-guiding roll better able to withstand the mechanical and thermal stresses, to ensure that it is suitable for large strand widths and to enable maintenance work to be carried out ~~{more cost-effectively}~~, ~~{it is proposed that}~~ the roll shell has coolant passages ~~{(22, 22a, 22b, 22c)}~~ passing through it, and the coolant passages are arranged in the roll shell at a constant distance from the cylindrical roll shell outer surface of the roll shell **and preferably at the area between the shaft and the roll shell**. It is preferable for at least one water guide ring ~~{(5)}~~ to be arranged between the roll shell and the central shaft.  
~~{(Figure 1)}~~